VERMONT YANKEE
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October 5, 2000
BVY 00-95

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington D.C. 20555

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Reportable Occurrence No. LER 2000-04, Rev. 0

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence as LER 2000-04, Rev. 0.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Kevin H. Bronson

Kevin H. Bronson
Plant Manager

cc: USNRC Region I Administrator
USNRC Resident Inspector – VYNPS
USNRC Project Manager – VYNPS
VT Dept. of Public Service

IE22

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-1998)

LICENSEE EVENT REPORT (LER)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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TITLE (4)
CONTROL CIRCUIT DESIGN AND THE USE OF AN INCORRECT LIGHT BULB EXTRACTION TOOL RESULTS IN A LOSS OF CONDENSER VACUUM AND A MANUAL PLANT TRIP

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	13	00	2000	04	00	10	05	00	N/A	

OPERATING MODE (9)	N
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR : (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		Specify in Abstract below or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Kevin Bronson, Plant Manager	(802) 257-7711

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (12)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
N/A						N/A				
N/A						N/A				

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On 9/13/00, a licensed operator replaced a position indicating light bulb for a steam jet air ejector (SJAE) inlet steam supply valve. The SJAE's are part of a balance of plant, non-nuclear safety system. During the bulb replacement a momentary electrical short was created and caused a protective fuse to blow in the valve control circuit. Although the valve was not in service while the bulb was being replaced, the affected control circuitry shares a common power supply fuse with the redundant (in-service) SJAE steam supply valves. Therefore, the fuse also disconnected power from the in-service SJAE steam supply valves, closing the valves. This caused a lowering main condenser vacuum. The operating crew followed plant procedures for the lowering condenser vacuum while seeking a replacement fuse. Approximately four minutes later, in response to the lowering condenser vacuum, the Station Shift Supervisor directed a manual trip of the reactor. The operating crew brought the plant to a stable shutdown condition following the plant trip. Investigation revealed that the short was caused by the use of an incorrect model bulb extraction tool. The short led to a plant trip because of the design of the associated valve control circuitry. The incorrect model tools were collected and removed from service. The correct model tools were made available. Training on this event was provided to appropriate plant personnel and included the use of the correct extraction tool. An assessment is ongoing to determine if a better extraction tool is available. A review of the adequacy of the affected valve control power circuit design will be performed. All plant safety systems functioned as required to bring the plant to a safe, stable shutdown condition. Therefore, this event presented no significant increase in risk to public health and safety.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

DESCRIPTION

On 9/13/00, with the plant operating at rated power, a licensed operator replaced the closed indicating light bulb for a SJAE inlet supply valve located in a control room panel. The SJAE's are part of a balance of plant, non-nuclear safety system. During the replacement a momentary electrical short was created that caused a protective fuse to blow in the valve control circuit. Although the subject valve was not in service while the bulb was being replaced, the affected control circuitry shares a common power supply fuse with the redundant (in-service) SJAE steam supply valves. Therefore, the fuse disconnected power from the in-service SJAE steam supply valves, closing the valves. The following timeline describes the sequence of events.

1625 A Licensed operator replaces the light bulb for the shut indication on the out of service SJAE steam supply isolation.

A spark is noted in or near the light bulb socket.

The operator notes the loss of position indication (both open and closed indicating lights extinguished) on both the in-service and standby SJAE steam supply isolation valves.

The operating crew notes lowering main condenser vacuum, and enters the VY procedure for a lowering main condenser vacuum.

The operating crew begins lowering reactor power, consistent with prescribed limits, using reactor recirculation flow.

1629 The operating crew completes a transfer of plant electrical loads to the off-site power source in accordance with plant procedures.

The operating crew initiates a manual reactor trip. The main condenser pressure is at an absolute pressure of 6.5 inches of mercury.

A primary containment isolation of groups 2a, 3, and 5 occurs due to a momentary low reactor water level caused by the plant trip, an expected plant response.

- Group 2a isolates liquid radioactive waste process lines penetrating primary containment.
- Group 3 isolates primary containment ventilation and purge process lines.
- Group 5 isolates Reactor Water Cleanup system process lines penetrating primary containment.

The operating crew begins execution of the appropriate plant procedures for operating the plant subsequent to a reactor trip.

1751 Conditions are stable with the plant in hot shutdown. The operating crew reports the plant trip to the USNRC as a four-hour non-emergency notification.

The cause of the lowering main condenser vacuum was the loss of motive steam to the Condenser Air Removal System SJAE resulting from the loss of control power to the affected valves when the electrical fuse blew. The closure of the steam supply valves also caused an air ejector suction valve closure due to the resulting low supply steam pressure.

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CAUSE

1. The cause of the short, and resulting manual shutdown, was the use of the incorrect model bulb extraction tool.

2. The short led to a plant trip because of the design of the associated valve control circuitry.

ANALYSIS

Main Condenser Gas Removal System Function

The Main Condenser Gas Removal System is a station power conversion system. Station power conversion systems are those systems that are required to convert the energy of nuclear generated steam to electrical energy. A twin-element, two-stage steam jet air ejector is provided to evacuate gases from the condenser during normal operation. Gases removed from the main condenser by the SJAE's are discharged to the station main stack through the station Advanced Off-Gas System. Air and other non-condensable gases must be continually removed to maintain a negative pressure in the main condenser, allowing continued, efficient electric power generation.

Plant Response to the Loss of Main Condenser Gas Removal System

A loss of function of the Main Condenser Gas Removal System while at power results in the accumulation of non-condensable gases within the condenser and a lowering condenser vacuum. Continued lowering of condenser vacuum could eventually result in an automatic closure of steam line valves that control the transmission of steam from the reactor to the main condenser via the main generator turbine. This feature is designed to assure that the integrity of the main condenser is not lost due to a condenser overpressure condition. The automatic steam valve closure would result in an automatic shutdown of the reactor.

During this event, the manual insertion of a reactor shutdown signal, using the manual scram push-buttons, precluded reliance upon automatic safety features.

The Plant Operating Staff, in response to the lowering condenser vacuum, took actions consistent with station procedures. Additionally, all plant safety systems functioned as designed to bring the plant to a safe, stable shutdown condition. Therefore, this event presented no significant increase in risk to public health and safety.

CORRECTIVE ACTIONS

1. The incorrect model tools were collected and removed from service. The correct extraction tools are available to station personnel.

2. Training on this event was provided to affected plant personnel. Training included the use of the proper extraction tool.

3. An assessment is ongoing to determine if a better extraction tool is available.

4. A review of the adequacy of the affected valve control power design will be performed.

5. VY will perform a follow-up verification to ensure that similar events have not occured.

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ADDITIONAL INFORMATION

Vermont Yankee has reported no similar events to the USNRC.

IEEE Codes applicable to this event: IL, EJR, PL, FU, ISV, COND, AD, JC, JE, CE, SA, WF

Light Socket Arrangement

The indicating light circuitry contains a light socket, a dropping resistor, and associated wiring. The dropping resistor serves to develop a voltage potential for the light bulb and to limit the current passing through the indicating light circuit. For the indicating light to function, the resistor can be physically located in either the power (hot) side or the neutral side of the circuit. Locating the resistor in the wiring between the hot side and the light socket would provide a "fault tolerant" circuit. In this arrangement, if the light socket were shorted to ground (as occurred in this event), the resistor would limit the current through the short, preventing protective actions, such as blowing a fuse. Placing the resistor in the circuit between the light socket and the common leg would allow a momentary short in the indicating light socket to draw sufficient current to blow the supply fuse.

The indicating light circuitry for the VY SJAE Steam Supply Valves have the resistors located between the light socket and the common leg. Therefore, the circuitry is not "fault tolerant."

Bulb Extraction Tool

Because of the physical arrangement of the indicating light socket, an extraction tool is required to remove the bulb. The extraction tool contains movable metal fingers, which are compressed to grasp the light bulb, and allow its removal from the socket. The extraction tool is has a mechanical stop (central dowel) designed to abut the top of the light bulb. This feature should prevent the metal fingers from reaching the metal light bulb components. The bulb replaced during this event is cylindrical, and contains metal contact surfaces along the socket end of the bulb. The design of the extraction tool in use at the time of the event (Figure 1) allowed the metal fingers of the tool to extend too far along the light bulb, coming into contact with the conducting surfaces of the bulb. The extraction tool used was the wrong model for the application. The correct model bulb extractor has a shorter distance between the mechanical stop (dowel) and the end of the metal fingers (Figure 2).

Figure 1 – Incorrect Tool

Figure 2. - Correct Tool